

# Waterhemp Management in Soybeans



## Waterhemp Biology

- Waterhemp gains a competitive advantage over several more aggressive summer annual weeds through the sheer number of plants that can infest an area. Season-long competition by waterhemp (more than 20 plants per square foot) has been shown to reduce soybean yield by 44%. Waterhemp that emerged as late as V5 soybean reduced yields up to 10%.
- Waterhemp grows more rapidly than most weeds or crops — typically about 1 to 1 ¼ inches per day during the growing season. This allows waterhemp seedlings to acquire more sunlight than other weeds.
- This species emerges throughout the growing season, and a higher percentage of plants can emerge later in the season than is typical with most other summer annual weeds. This emergence pattern allows waterhemp to avoid many pre-emergence herbicides and often allows this weed to flourish after post-emergence applications of non-residual herbicides like glyphosate.
- Waterhemp is a prolific seed producer and able to produce as many as 1.5 times more seed than most other pigweed species. Plants generally produce about 250,000 seeds per plant, although some plants can produce as many as 1,000,000 or more when growing under optimal conditions in noncompetitive environments.
- The seeds are small (approximately 3-mm in length) and can easily be transported by contaminated machinery, by waterfowl, through the spread of poultry litter as fertilizer, etc.
- Like most weeds, waterhemp seeds remain viable in the soil for several years. Research has shown that only 1 to 12% of waterhemp seed remain viable in the soil seedbank after 4 years.

## Genetic Diversity and Herbicide Resistance in Waterhemp

- Waterhemp is dioecious (male and female flowers on separate plants), and must outcross. Therefore the genetic diversity within a waterhemp population tends to be greater than for most agronomic weeds. This genetic diversity increases the potential for evolving and spreading novel herbicide resistance genes and other traits that improve waterhemp survival in agronomic systems.
- Waterhemp has a remarkable ability to adapt to control tactics and has evolved resistance to herbicides from

many different classes. To date, waterhemp has evolved resistance to herbicides from six classes, including Group 5 (e.g., triazines like atrazine and simazine), Group 2 (e.g., ALS-inhibiting herbicides like Pursuit® and Classic®), Group 14 (e.g., PPO-inhibiting herbicides like Ultra Blazer®, Cobra®, and Flexstar®), Group 9 (e.g., glyphosate), Group 27 (e.g., HPPD-inhibiting herbicides like Callisto®, Laudis®, and Impact®), and Group 4 (e.g., 2,4-D).

- Many populations in the Midwest now exhibit multiple herbicide resistances that include herbicides from several families. For example, Group 2 and 9 (e.g., ALS- and glyphosate) resistance in waterhemp is fairly common, and in many states resistance to herbicides from as many as 3, 4, or 5 groups now occurs. In 2017, a population with resistance to herbicides from 6 commonly-used herbicide groups was confirmed. It should be noted that Group 14 PPO-inhibitor herbicides with residual activity are likely to have utility in controlling PPO-resistant waterhemp when applied pre-emergence.

## Management of Herbicide-Resistant Waterhemp in Soybean

The focus of this section is predominantly chemical control. However, given the extent of herbicide-resistant waterhemp populations, cultural and mechanical options, such as the following, should be considered:

- Narrow row spacing and optimum soybean planting populations, which increase the crop's ability to outcompete waterhemp for nutrients and resources.
- Deep tillage, which reduces the amount of waterhemp seed that germinates by burying the seed at unfavorable depths. A program consisting of deep tillage in combination with residual herbicides has been shown to reduce emergence of pigweeds, including waterhemp, by 97%.
- Fall-seeded cover crops, such as cereal rye, which can reduce early-season waterhemp emergence during the next spring.

The most effective strategies to reduce herbicide-resistant waterhemp populations will integrate cultural and mechanical techniques with chemical control.

### Chemical Control

1. Soon before or after soybean planting, apply a full rate (according to label guidelines for soil type and organic matter content) of an *effective* pre-emergence, soil-residual herbicide.

Continued / ►

- **Why invest in a soil-residual herbicide?** Over-reliance on post-emergent herbicides for waterhemp control has contributed substantially to waterhemp developing herbicide resistance. Application of an effective, soil-applied residual herbicide introduces an effective herbicide group, such as Group 15 (Dual II Magnum®, Zidua®, etc.) to the control program and delays emergence of waterhemp, which protects soybean yield potential from early season interference.
  - **Why use a full rate instead of a reduced (“set-up”) rate?** Waterhemp emergence extends late into the growing season. The later that waterhemp emergence can be delayed, the greater the potential to achieve maximum or near-maximum soybean yield and improve the success of post-emergence herbicide treatments. Reduced rates are likely to reduce the percentage of the waterhemp population that will be controlled by the post-emergent products. Full rates are also more likely to delay the onset of herbicide resistance when compared to reduced rates.
  - Depending on the herbicide resistance profile, effective soil-residual herbicides may include: Authority® First, Authority Assist, Authority MTZ, Authority XL, Boundary®, Dual II Magnum (or other metolachlor products), Enlite®, Envive®, Fierce®, Gangster®, Outlook®, Prefix®, Sencor®, Sonic®, Treflan®, Valor®, Valor XLT, Warrant® and Zidua.
2. Apply an effective post-emergence herbicide with an overlapping residual herbicide.
    - a. **In conventional or glyphosate-tolerant soybean:** If Group 9 (e.g., glyphosate) resistance in waterhemp is known or suspected and there is no reason to believe the population is also resistant to Group 14 (e.g., PPO-inhibitors) herbicides, apply a Group 14 herbicide like Cobra, Flexstar, or Ultra Blazer to waterhemp not more than 3-4 inches in height.
      - In glyphosate-resistant soybean, glyphosate can be applied in combination with a Group 14 herbicide, depending on the spectrum of other weeds present.
      - The size of the waterhemp at the time of application is a critical determinant of the level of waterhemp control achieved, as Group 14 herbicides are most effective against waterhemp four inches or less in height.
      - Group 14 herbicides like Flexstar and Cobra should be applied in a minimum of 15 gallons of water per acre. In dense weed/crop canopies, 20 to 40 gallons of water per acre should be used to ensure thorough spray coverage.
    - b. **In glufosinate-tolerant soybean:** Remember that it is critical to apply an effective, pre-emergence soil-residual herbicide as outlined in Step 1. Then, apply glufosinate (Group 10 herbicide) to waterhemp not more than 3 to 4 inches in height.
      - The waterhemp size at the time of the application will be an important determining factor in the level of waterhemp control achieved.
      - Glufosinate should be applied in a minimum of 15 gallons of water per acre. In dense weed/crop canopies, 20 to 40 gallons of water per acre should be used to ensure thorough spray coverage.
      - Apply glufosinate using nozzles and pressures that generate medium (250 – 350 micron) spray droplets. Do not use nozzles that produce ultra-coarse, extremely coarse, or very coarse sprays.
      - The addition of an overlapping residual herbicide to the post-emergence glufosinate treatment is likely to reduce or eliminate waterhemp emergence for the remainder of the season. Effective overlapping residual herbicides include but are not limited to Group 15 herbicides such as Anthem, Cinch, Dual II Magnum, Outlook, Prefix, Warrant, and Zidua.
  3. Scout the field within 7 to 14 days after the initial post-emergence application to determine treatment effectiveness. If there are still surviving plants present, rogue these plants from the field before they reach a reproductive growth stage.
    - If Prefix has been applied pre-emergence, do not apply Flexstar or any fomesafen product post-emergence due to label restrictions.
    - **If Group 14 resistance is also known or suspected** in the waterhemp population, the only additional options for waterhemp control include: 1) apply an overlapping residual herbicide prior to the emergence of any subsequent waterhemp germination events, 2) inter-row cultivation, or 3) hand roging.
    - Regardless of the herbicide resistances in waterhemp, the addition of an effective overlapping residual herbicide to the post-emergence herbicide is likely to reduce or eliminate waterhemp emergence for the remainder of the season. Effective overlapping residual herbicides include but are not limited to Group 15 herbicides such as Anthem®, Cinch®, Dual II Magnum, Outlook, Prefix, Warrant, and Zidua.

For more information and links to additional resources, visit [www.IWillTakeAction.com](http://www.IWillTakeAction.com).

Technical editing for this publication was led by Kevin Bratley, Ph.D., University of Missouri, and Mandy Bush, Ph.D., University of Missouri, in partnership with other universities in the soybean-growing regions of the United States. Take Action is supported by BASF, Bayer, Dow, Dupont, FMC, Monsanto, Syngenta, Valent and corn, cotton, sorghum, soy and wheat organizations. The United Soybean Board and all Take Action partners, including the companies mentioned above, neither recommend nor discourage the implementation of any advice contained herein, and are not liable for the use or misuse of the information provided.

©2013 United Soybean Board.

Brought to you by the soy checkoff. 

